

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Lalit K. MESTHA et al,

Group Art Unit: 2163

Application No.: 10/758,096

Examiner: W. LEE

Filed: January 16, 2004

Docket No.: 116588

For. REFERENCE DATABASE AND METHOD FOR DETERMINING SPECTRA USING
MEASUREMENTS FROM AN LED COLOR SENSOR AND METHOD OF
GENERATING A REFERENCE DATABASE

DECLARATION UNDER 37 C.F.R. §1.131

Director of the U.S. Patent and Trademark Office
Washington, D.C. 20231

Sir:

We.

Lalit K. MESTHA

Sohail A. DIANAT

Francesca G. POLO

Gary W. SKINNER

hereby declare and state as follows:

1. This Declaration is submitted as evidence that the subject matter claimed in at least claims 1 and 4-6 of the above-identified application was invented by us prior to March 20, 2003.

2. We are named as the inventors in the above-identified application

3. Prior to March 20, 2003, we conceived and actually reduced to practice in the United States the invention claimed in the above-identified claims. Specifically, we conceived and actually reduced to practice:

Regarding claim 1. A method of partitioning a reference database for determining a reflectance spectrum, comprising:

establishing a plurality of clusters, each cluster initially being an empty set;

identifying, for each training sample of a plurality of training samples, a most appropriate cluster among the plurality of clusters; and

assigning each training sample to the most appropriate cluster, thereby filling the empty sets, each training sample correlating a reference spectrum with a corresponding plurality of normalized illuminant sensor outputs for reference colors.

Regarding claim 4: The method according to claim 1, wherein.

the establishing the plurality of clusters comprises establishing a plurality of cluster centroids, the cluster centroids being established through vector quantization.

Regarding claim 5: A reference database partitioned by the method of claim 1, the reference database being machine-readable.

Regarding claim 6: A storage medium on which is recorded a program for implementing the method of claim 1.

4. Exhibit A attached hereto reflects actual data obtained by us, using the method, reference database and storage medium described above prior to March 20, 2003.

Specifically, Exhibit A includes Tables 1-3. Table 1 is a prediction accuracy table, showing actual accuracy results obtained in determining a reflectance spectrum using a reference database partitioned as described above. Table 2 shows the actual computational time per color sample, for reference databases with differing numbers of clusters. Table 3 shows the number of colors in each cluster, for reference databases with differing numbers of clusters.

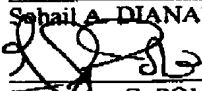
5. We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and/or imprisonment under §1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing therefrom.

DATE: 3/3/08


Lalit K. MESTHA

DATE: _____

DATE: 03/03/2008

Sahail A. DIANAT

Francesca G. POLO

DATE: 3/1/2008

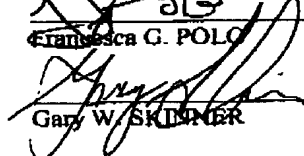

Gary W. SKINNER

EXHIBIT A

Table 1: Prediction accuracy table

Reference Data Base = 1901 ColorSamples
Prediction Population = 475 Color Samples

Accuracy

# of clusters	Mean DE	Sigma	Min	Max	DE+2*Sigma
1	0.541888753	0.2995326	0.0271296	2.264817	1.140953964
2	0.543016564	0.3007189	0.01853	2.2549153	1.144454454
3	0.542491584	0.3019281	0.0194983	2.2527023	1.146347764
4	0.543563483	0.3035176	0.0182536	2.2516126	1.150598675
5	0.545364446	0.2998901	0.0221704	2.2515894	1.145144708
6	0.543651769	0.3049734	0.0177756	2.3071299	1.15359858
7	0.544294072	0.3024901	0.0237027	2.3208969	1.149274363
8	0.545729555	0.3013133	0.0237027	2.3185178	1.148356172
9	0.545457629	0.3000988	0.0254683	2.3185178	1.145655208
10	0.545611115	0.2999446	0.0254683	2.291039	1.145500394

Table 2: Execution Time for L*a*b* and spectral computation

**Computational Time per Color Sample in
 Sec (MATLAB with 800 MHz PC)**

of clusters Absolute Relative

1 (all data)	0.244098947	1
2	0.139694737	0.5722873
3	0.115682105	0.4739148
4	0.080578947	0.3301077
5	0.073221053	0.2999646
6	0.053507368	0.2192036
7	0.04908	0.201066
8	0.047901053	0.1962362
9	0.046951579	0.1923465
10	0.038793684	0.1589261

Table 3: # of colors in each cluster

# of clusters	1	2	3	4	5	6	7	8	9	10
1 (all data)	1901	0	0	0	0	0	0	0	0	0
2	683	1218	0	0	0	0	0	0	0	0
3	1049	174	678	0	0	0	0	0	0	0
4	511	509	708	173	0	0	0	0	0	0
5	191	166	502	707	335	0	0	0	0	0
6	317	168	334	349	338	395	0	0	0	0
7	251	264	393	166	311	184	332	0	0	0
8	179	177	302	166	391	179	184	323	0	0
9	172	302	177	391	175	171	179	165	169	0
10	165	177	175	247	171	172	280	169	169	176

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Lalit K. MESTHA et al.

Group Art Unit: 2163

Application No.: 10/758,096

Examiner: W. LEE

Filed: January 16, 2004

Docket No.: 116588

For: REFERENCE DATABASE AND METHOD FOR DETERMINING SPECTRA USING
MEASUREMENTS FROM AN LED COLOR SENSOR AND METHOD OF
GENERATING A REFERENCE DATABASE

DECLARATION UNDER 37 C.F.R. §1.131

Director of the U.S. Patent and Trademark Office
Washington, D.C. 20231

Sir:

We:

Lalit K. MESTHA

Sohail A. DIANAT

Francesca G. POLO

Gary W. SKINNER

hereby declare and state as follows:

1. This Declaration is submitted as evidence that the subject matter claimed in at least claims 1 and 4-6 of the above-identified application was invented by us prior to March 20, 2003.

2. We are named as the inventors in the above-identified application.

3. Prior to March 20, 2003, we conceived and actually reduced to practice in the United States the invention claimed in the above-identified claims. Specifically, we conceived and actually reduced to practice:

Regarding claim 1: A method of partitioning a reference database for determining a reflectance spectrum, comprising:

establishing a plurality of clusters, each cluster initially being an empty set;
identifying, for each training sample of a plurality of training samples, a most appropriate cluster among the plurality of clusters; and
assigning each training sample to the most appropriate cluster, thereby filling the empty sets, each training sample correlating a reference spectrum with a corresponding plurality of normalized illuminant sensor outputs for reference colors.

Regarding claim 4: The method according to claim 1, wherein:

the establishing the plurality of clusters comprises establishing a plurality of cluster centroids, the cluster centroids being established through vector quantization.

Regarding claim 5: A reference database partitioned by the method of claim 1, the reference database being machine-readable.

Regarding claim 6: A storage medium on which is recorded a program for implementing the method of claim 1.

4. Exhibit A attached hereto reflects actual data obtained by us, using the method, reference database and storage medium described above prior to March 20, 2003.

Specifically, Exhibit A includes Tables 1-3. Table 1 is a prediction accuracy table, showing actual accuracy results obtained in determining a reflectance spectrum using a reference database partitioned as described above. Table 2 shows the actual computational time per color sample, for reference databases with differing numbers of clusters. Table 3 shows the number of colors in each cluster, for reference databases with differing numbers of clusters.

5. We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and/or imprisonment under §1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing therefrom.

DATE: _____

Lalit K. MESTHA

DATE: 3/3/2008

Sohail A. Dianat
Sohail A. DIANAT

DATE: _____

Francesca G. POLO

DATE: _____

Gary W. SKINNER

EXHIBIT A

Table 1: Prediction accuracy table

Reference Data Base = 1901 ColorSamples
Prediction Population = 475 Color Samples

Accuracy

# of clusters	Mean DE	Sigma	Min	Max	DE+2*Sigma
1	0.541888753	0.2995326	0.0271296	2.264817	1.140953964
2	0.543016564	0.3007189	0.01853	2.2549153	1.144454454
3	0.542491584	0.3019281	0.0194983	2.2527023	1.146347764
4	0.543563483	0.3035176	0.0182536	2.2516126	1.150598675
5	0.545364446	0.2998901	0.0221704	2.2515894	1.145144708
6	0.543651769	0.3049734	0.0177756	2.3071299	1.15359858
7	0.544294072	0.3024901	0.0237027	2.3208969	1.149274363
8	0.545729555	0.3013133	0.0237027	2.3185178	1.148356172
9	0.545457629	0.3000988	0.0254683	2.3185178	1.145655208
10	0.545611115	0.2999446	0.0254683	2.291039	1.145500394

Table 2: Execution Time for L*a*b* and spectral computation

**Computational Time per Color Sample in
 Sec (MATLAB with 800 MHz PC)**

# of clusters	Absolute	Relative
1 (all data)	0.244098947	1
2	0.139694737	0.5722873
3	0.115682105	0.4739148
4	0.080578947	0.3301077
5	0.073221053	0.2999646
6	0.053507368	0.2192036
7	0.04908	0.201066
8	0.047901053	0.1962362
9	0.046951579	0.1923465
10	0.038793684	0.1589261

Table 3: # of colors in each cluster

# of clusters	1	2	3	4	5	6	7	8	9	10
1 (all data)	1901	0	0	0	0	0	0	0	0	0
2	683	1218	0	0	0	0	0	0	0	0
3	1049	174	678	0	0	0	0	0	0	0
4	511	509	708	173	0	0	0	0	0	0
5	191	166	502	707	335	0	0	0	0	0
6	317	168	334	349	338	395	0	0	0	0
7	251	264	393	166	311	184	332	0	0	0
8	179	177	302	166	391	179	184	323	0	0
9	172	302	177	391	175	171	179	165	169	0
10	165	177	175	247	171	172	280	169	169	176